AMENDMENT TO THE CLAIMS

1. (Currently amended) An imaging device that outputs brightness information according to an amount of incident light, comprising:

an imaging unit that includes a plurality of unit cells arranged one dimensionally or two-dimensionally, each unit cell including a photoelectric conversion part that generates a first output voltage in a reset state and a second output voltage according to an amount of incident light, and each unit cell generating a reset voltage that corresponds to the first output voltage and a read voltage that corresponds to the second output voltage; and

an output unit operable to output, in relation to each unit cell, brightness information indicating a difference between the reset voltage and the read voltage when normal light is incident to the imaging device and the read voltage is in a predetermined range, and brightness information indicating high brightness when strong light is incident to the imaging device and the read voltage is not in the predetermined range.

2. (Original) The imaging device of Claim 1,

wherein the output unit includes:

a first output line that is connected to the imaging unit and receives the reset voltage and the read voltage output from each unit cell;

a second output line that is connected to a circuit of a subsequent stage and outputs brightness information to the circuit of the subsequent stage;

a clamp capacitance that is connected in series between the first output line and the second output line; and

a bypass transistor that is connected in parallel with the clamp capacitance, and brings the first output line and the second output line out of conduction not to bypass the clamp capacitance

in a first case where a voltage applied between terminals of the clamp capacitance is in the predetermined range, and brings the first output line and the second output line into conduction to bypass the clamp capacitance in a second case where the voltage applied between the terminals is not in the predetermined range.

3. (Original) The imaging device of Claim 2,

wherein the first case is where an electric potential of the first output line is higher than a barrier potential of the bypass transistor, and

the second case is where the electric potential of the first output line is equal to or smaller than the barrier potential of the bypass transistor.

4. (Original) The imaging device of Claim 3,

wherein the output unit further includes:

a sampling capacitance that is connected in series between the second output line and a terminal for supplying a predetermined voltage;

a clamp transistor that is connected in series between the second output line and a terminal for supplying a reference voltage; and

a control unit operable to control a reset voltage to be output to the first output line in a state where the clamp transistor is ON and the second output line is set at the reference voltage, and then control a read voltage to be output to the first output line in a state where the clamp transistor is OFF, and

wherein when a reset voltage that is in the predetermined range is output to the first output line in a state where the clamp transistor is ON and the second output line is set at the

reference voltage, an equivalent to a difference between the reference voltage and the reset voltage is held by the clamp capacitance, and then when a read voltage that is in the predetermined range is output to the first output line in a state where the clamp transistor is OFF, a voltage of the second output line changes from the reference voltage by an amount corresponding to the equivalent held by the clamp capacitance, so that brightness information indicating a difference between the reset voltage and the read voltage is output, and

when a read voltage that is not in the predetermined range is output to the first output line in a state where the clamp transistor is OFF, the bypass transistor brings the first output line and the second output line into conduction to bypass the clamp capacitance and so the voltage of the second output line is replaced by the read voltage, so that brightness information indicating high brightness is output regardless of whether the reset voltage is in the predetermined range.

5. (Original) The imaging device of Claim 3,

wherein the output unit further includes:

a sampling capacitance that is connected in series between the second output line and a terminal for supplying a predetermined voltage;

a clamp transistor that is connected in series between the second output line and a terminal for supplying a reference voltage; and

a control unit operable to switch the clamp transistor ON in a state where a read voltage is output to the first output line, and then switch the clamp transistor OFF and controls a reset voltage to be output to the first output line, and

wherein when the clamp transistor is switched ON in a state where a read voltage that is in the predetermined range is output to the first output line, an equivalent to a difference between

the reference voltage and the read voltage is held by the clamp capacitance, and then the clamp transistor is switched OFF and a reset voltage that is in the predetermined range is output to the first output line, and a voltage of the second output line changes from the reset voltage by an amount corresponding to the equivalent held by the clamp capacitance, so that brightness information indicating a difference between the reset voltage and the read voltage is output, and

the bypass transistor brings the first output line and the second output line into conduction to bypass the clamp capacitance in a state where a read voltage that is not in the predetermined range is output to the first output line and so no voltage is held by the clamp capacitance, so that brightness information indicating high brightness is output.

6. (Original) The imaging device of Claim 3,

wherein the output unit further includes a voltage supplying unit operable to supply a bias voltage to a gate of the bypass transistor.

7. (Original) The imaging device of Claim 3,

wherein the bypass transistor is a depletion-mode transistor.

8. (Original) The imaging device of Claim 3,

wherein each unit cell includes:

a light-receiving element operable to generate charge according to an amount of incident light;

a charge detecting unit operable to hold the charge generated by the light-receiving element and output the charge as a voltage signal;

a reset transistor that is connected in series between a reset terminal for supplying a reference voltage and the charge detecting unit, and when a gate voltage is applied thereto, the reset transistor is brought into conduction, so that the charge detecting unit is reset to the reference voltage; and

an amplifier transistor that is connected between an amplifier terminal for supplying a reference voltage and the first output line, and when a voltage signal converted by the charge detecting unit is applied to a gate thereof, the voltage signal is amplified and the amplified voltage signal is output to the first output line, and

wherein a barrier potential of the bypass transistor is higher by a predetermined amount than an electric potential of a saturation signal that is an output of the amplifier transistor and that depends on an electric potential of the reset transistor being out of conduction.

9. (Original) The imaging device of Claim 8,

wherein a difference between the barrier potential of the bypass transistor and the electric potential of the saturation signal is substantially 0.1V.

10. (Original) The imaging device of Claim 8,

wherein the output unit further includes a voltage supplying unit operable to supply a bias voltage to a gate of the bypass transistor, and

wherein a difference between the barrier potential of the bypass transistor and the electric potential of the saturation signal is set by the bias voltage.

11. (Original) The imaging device of Claim 10,

wherein the bypass transistor and the reset transistor are manufactured in one process.

12. (Original) The imaging device of Claim 10,

wherein the voltage supplying unit includes a bias setting circuit that enables an appropriate bias unique to the imaging device to be set from outside.

13. (Original) The imaging device of Claim 8,

wherein the reset transistor is manufactured by a predetermined process of burying through injection, and

the bypass transistor is manufactured by the predetermined process of burying through injection and an additional injection process, and

wherein a difference between the barrier potential of the bypass transistor and the electric potential of the saturation signal is set by the additional injection process.

14. (Original) The imaging device of Claim 8,

wherein a first substrate bias voltage is applied to the bypass transistor, the first substrate bias voltage having an electric potential different from a second substrate bias voltage applied to the reset transistor, and

wherein a difference between the barrier potential of the bypass transistor and the electric potential of the saturation signal is controlled by a difference between the first substrate bias voltage and the second substrate bias voltage.

15. (Original) The imaging device of Claim 3,

wherein the output unit further includes a clip transistor operable to output, as brightness information indicating high brightness, a voltage matching an input dynamic range of the circuit

of the subsequent stage that is an analogue circuit, when a voltage that is a difference between an electric potential of the first output line and an electric potential of the second output line is not in the predetermined range.

16. (Original) The imaging device of Claim 15,

wherein the clip transistor is connected between a terminal for supplying a voltage corresponding to a maximum voltage of the input dynamic range of the circuit of the subsequent stage and the second output line, and when a predetermined voltage is applied to a gate thereof, the clip transistor is temporarily brought into conduction, so that a voltage matching the input dynamic range is output from the second output line to the circuit of the subsequent stage, and

the output unit further includes a clip transistor control unit operable to pulse drive the clip transistor by temporarily bringing the clip transistor into conduction, where a pulse voltage is applied to a gate of the clip transistor when the circuit of the subsequent stage inputs the brightness information.

17. (Original) The imaging device of Claim 3,

wherein the output unit further includes;

a sampling transistor that is connected in series between the first output line and the clamp capacitance; and

a sampling transistor control unit operable to bring the sampling transistor out of conduction in a vertical blanking period during which brightness information is not output from the imaging unit.

18. (Original) The imaging device of Claim 3,

wherein each unit cell includes:

an amplifier transistor that is connected in series between an amplifier terminal for supplying a reference voltage and the first output line, and when a voltage signal converted by a charge detecting unit is applied to a gate thereof, the voltage signal is amplified and the amplified voltage signal is output to the first output line; and

a select transistor that is connected in series between the amplifier terminal and the amplifier transistor or between the amplifier transistor and the first output line, and

the output unit further includes:

a load transistor operable to read the output voltage via the amplifier transistor and the select transistor by loading the first output line when the load transistor is in conduction; and

a control unit operable to

(a) bring a select transistor included in one or more of the unit cells into conduction before bringing the load transistor into conduction,

(b) bring the load transistor out of conduction before bringing select transistors included in all the unit cells out of conduction, and

(c) bring the load transistor out of conduction during a vertical blanking period during which brightness information is not output from any of the unit cells.

19. (Currently amended) An imaging method for use in an imaging device that includes an imaging area formed by a plurality of unit cells arranged one dimensionally or two-dimensionally, and outputs brightness information according to an amount of incident light, each unit cell including a photoelectric conversion part that generates a first output voltage in a reset

state and a second output voltage according to an amount of incident light, and each unit cell generating a reset voltage corresponding to the first output voltage and a read voltage corresponding to the second output voltage, the method comprising:

a judgment step of judging, in relation to each unit cell, whether the read voltage is in a predetermined range;

a first output step of outputting brightness information indicating a difference between the reset voltage and the read voltage when normal light is incident to the imaging device and the read voltage is judged to be in the predetermined range; and

a second output step of outputting brightness information indicating high brightness when strong light is incident to the imaging device and the read voltage is judged not to be in the predetermined range.